



Original Article

A new theory on the cause of anal fissure – impaction theory



Chen Shaoming ^{a,*}, Yu Qinghuan^b

^a Shidong Hospital Affiliated to University of Shanghai for Science and Technology, Shanghai, PR China

^b Yingbo Hospital, Pudong New Area, Shanghai, PR China

ARTICLE INFO

Article history:

Received 3 March 2020

Accepted 21 June 2020

Available online 6 September 2020

Keywords:

Anal fissure

Etiology

Impaction theory

Palavras-chave:

Fissura anal

Etiologia

Teoria da impactação

ABSTRACT

The internal hemorrhoid, rectal tumor, hypertrophic anal papilla, and secret fecal mass are regarded as the blocks embedded in the rectum. The above blocks hinder defecation, which will inevitably lead to excessive opening of the anal caliber. Once the limit is exceeded, the skin of the anal canal will tear and form anal fissure. Based on the study of historical evolution, hypothesis reasoning, clinical verification and comparison with other theories, a new concept of anal fissure etiology–impaction theory is proposed. The so-called impaction theory refers to the impaction (various primary lesions) in anorectum, which hinders defecation. When defecating, the anal canal expands beyond the limit, and the whole layer of anal canal skin splits, that is to say, anal fissure is formed.

© 2020 Sociedade Brasileira de Coloproctologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Uma nova teoria sobre a causa da fissura anal - teoria da impactação

RESUMO

A hemorroida interna, o tumor retal, a papila anal hipertrófica e a massa fecal secreta são considerados os blocos incrustados no reto. Os bloqueios acima impedem a defecação, o que inevitavelmente levará a uma abertura excessiva do calibre anal. Uma vez que o limite é excedido, a pele do canal anal rasga e forma uma fissura anal. Com base no estudo da evolução histórica, raciocínio de hipóteses, verificação clínica e comparação com outras teorias, um novo conceito de etiologia da fissura anal – a teoria da impactação – é proposto. A chamada teoria da impactação refere-se à impactação (várias lesões primárias) no anorreto, o que dificulta a defecação. Na defecação, o canal anal se expande além do limite e toda a camada da pele do canal anal rasga, ou seja, forma-se a fissura anal.

© 2020 Sociedade Brasileira de Coloproctologia. Publicado por Elsevier Editora Ltda. Este é um artigo Open Access sob uma licença CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author.

E-mails: 395276816@qq.com, 2813733199@qq.com (S. Chen).

<https://doi.org/10.1016/j.jcol.2020.06.006>

2237-9363/© 2020 Sociedade Brasileira de Coloproctologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Background

The treatment of intractable anal fissure is generally considered to be more difficult, so many operations have been derived, such as lateral sphincterotomy, ctenophorectomy and so on. However, in my clinical work, I found that most of the patients with obstinate and old anal fissure were accompanied by other diseases of anorectal department, such as hypertrophy of anal papilla, hemorrhoids, prolapse of rectum, outlet obstruction constipation, etc. Therefore, we believe that anal fissure is a secondary disease, which can not only be cured by operation, but also by primary disease. Therefore, we put forward a new concept of the etiology of anal fissure–impaction theory.

Anal fissure, that is to say, the whole layer of the skin of the anal canal is cracked. The typical symptom is periodic pain, which forms spindle ulcer for a long time. The clinical manifestations are pain, hemorrhage, and constipation. The etiological theories include infection, trauma, anatomic factors, internal sphincter contracture, chronic inflammatory stimulation, and anal stenosis. The author believes that the above theories cannot fully summarize the formation of anal fissure. Therefore, according to the results of clinical research, a new concept of the etiology of anal fissure–impaction theory is proposed.

Historical evolution

Chinese traditional Chinese medicine literature has a more detailed record of the clinical manifestations and treatment methods of anal fissure. The disease belongs to the category of hemorrhoids. The 24 hemorrhoids in surgical Dacheng include hemorrhoids inside and outside the anus, broken seams, such as sheep dung, and those with post fecal hemorrhage, foul smell, and great pain. In the chapter of the golden hemorrhoids of Yizong, it is recorded that “the anus is surrounded, the fold lines are broken, and the fire is dry”. These papers vividly describe the manifestation of anal fissure and emphasize that constipation is the cause of the disease. There are seventy-two kinds of hemorrhoid fistula written by Ma Pei in Qing Dynasty, which has been recorded as “split anal hemorrhoid”. The Chinese medicine treats this disease, advocates treating the disease for the root, pays attention to the non-surgical treatment, this has the obvious difference compared with the emphasis on the surgical method.

Some modern theories of anal fissure

Anatomic theory

The external anal sphincter is divided into two parts from the tailbone to the rear of the anal canal, which encircles the anal canal along both sides of the anal canal; the external anal sphincter is connected to the two parts in front of the anal canal, leaving a gap in front and rear of the anal canal. Most of the levator ani muscle is attached to both sides of the anal canal, less in the front and the back. The back and the front of the anal canal are not as strong as the two sides and are easy

to be damaged. The anal canal forms an anal and rectal angle downward and backward, and the back of the anal canal is subject to greater fecal pressure. The blood supply of the posterior median line of the anal canal is less and its elasticity is less.

Trauma factors

Hard feces can tear the skin of anus; frequent defecation causes sensitive constriction of anal canal, and normal consistency feces can also cause damage. Chronic inflammation of anal canal, hyperplasia of fibrous tissue, formation of anal comb induration, hindering sphincter relaxation, making anal canal easy to be damaged and torn. The causes of anal fissure include foreign body in rectum, improper method of anal expansion, anal operation, delivery, congenital anal stenosis and proocolonitis. There are two kinds of theories¹: the theory of skin tear: the first one is ball² in 1908. He assumed that anal fissure is a line like wound formed by the anal flap torn by dry hard fecal mass and extending downward. He compared it to the avulsion of the skin of the paronychia and the “sentinel hemorrhoids” caused by edema and repeated abrasions.² Blaisdell’s grid gate theory³: according to the anatomical arrangement of the external sphincter, Blaisdell pointed out in 1937 that the superficial muscle bundle of the external sphincter had a Y-shaped bifurcation at the rear of the anus and formed a minor triangle with the lower part of the skin, where the skin of the anal canal lacked muscle support and was a weak area. He thinks that the lower part of the skin is like a grid, which is located at the posterior edge of the anus and in front of the triangle. When the dry hard fecal block crosses the front, it is easy to tear the skin. He advocated the treatment of anal fissure by cutting off the lower part of the external sphincter. However, it has been found that the base of anal fissure is not the lower part of the external sphincter skin, but the internal sphincter. The external sphincter is not the cause of anal fissure.

Infection factors

Acute and chronic anal sinusitis, anal papilla, internal hemorrhoids, and polyps are the main causes of infection. Infection enters the human anal gland through the glandular canal, and abscesses are formed in the subcutaneous tissue of the anal canal. Ulcers are formed after rupture. Small superficial thrombosis may cause anal fissure due to thrombophlebitis caused by infection.¹ The theory of crypt gland infection: Rankin et al.⁴ proposed in 1932 that anal crypt infection can cause anal fissure. Because the anal glands are mostly located at the back of the anal canal, it seems that anal fissure is more likely to occur in the midline of the anal canal, but the appearance of the real ulcer caused by infection rather than anal fissure is completely different. Rankin et al. also pointed out that anal fissure is varicose ulceration. The reason is that: the subcutaneous vein of anal canal is in a curve state, phlebitis can lead to phlebitis, phlebitis can lead to skin lesions, and the damaged skin loses its resistance to trauma, resulting in anal fissure. According to this theory, it seems that it can explain the reason why anal fissure is difficult to heal, but it can’t explain why anal fissure is prone to

postnatal position. Although he thinks it is caused by the susceptibility of anal right angle to defecation trauma, there is insufficient evidence.² Theory of residual epithelial infection: in 1982, shafik⁵ tried to explain why anal fissure is chronic from embryology. He pointed out that during the formation of the anal canal in the embryonic stage, the procanal and the hindgut were intussuscepted.

Internal sphincter spasm theory

The anal sphincter is in spasm state because of the injury or inflammation stimulation of the anal canal, resulting in the enhancement of anal canal force and the easy injury of anal fissure. The work of Eisenhammer⁶ in the 1950s gave modern concepts to the etiology of anal fissure. He first found that the muscle bundle at the bottom of the anal fissure was the internal sphincter rather than the lower part of the external sphincter skin. He proposed that the cause of anal fissure was spasm or fibrosis of the internal sphincter rather than the so-called chlamydoscopy; internal sphincterotomy rather than chlamydoscopy should be used to treat anal fissure. He not only corrected the misrepresentation of the Chlamydomonas, but also protected the lower part of the external sphincter from damage. Internal sphincter spasm is the cause or result of anal fissure. Almost all chronic anal fissure is accompanied by high tension and high anal pressure of internal sphincter. Schouten et al.⁷ (1996) recently measured the mean anal Maximum Resting Pressure (MARP), which was significantly higher in patients with anal fissure than in the normal control group (121.07 ± 16.97 mmHg and 68.78 ± 24.48 mmHg). Northmann et al.⁸ (1974) found that the internal sphincter of anal fissure patients was not relaxed but over contracted when the rectum was inflated. The abnormal activity of internal sphincter is usually considered as the result of chronic inflammatory stimulation of anal fissure or the reflex reaction of internal sphincter caused by pain. But this hypothesis has no experimental basis and may be misleading. Because the pain of anal fissure disappeared and the average anal Maximum Resting Pressure (MARP) did not decrease after local anesthesia, it suggested that spasm was not secondary to pain.

Theory of anal narrow primary school

Anal skin in the development of slow, resulting in narrow anal canal, easy to damage into anal fissure. At present, scholars think that anal sinusitis, internal sphincter spasm and anal stricture are the secondary diseases of anal fissure.

Analysis of current theories

The theory of anatomical factors of anal fissure: the anatomical structure of anorectum is the congenital condition that anal fissure is easy to occur in the special part of anus. It is not the direct cause of anal fissure.

According to the trauma theory, trauma is a link in the process of anal fissure, but not the cause.

Infectious theory of anal fissure: the author believes that infection can occur after the formation of anal fissure; it is the condition for the transformation of anal fissure to chronic and

pathological changes, and it may also occur before the formation of anal fissure, which is the condition for the aggravation or transformation of hemorrhoids.

Infection of hemorrhoids, inflammation of anal papilla, constipation → dysdefecation, formation of new anal fissure → new anal fissure (fresh wound) → infection → non healing of wound → spasm of anal sphincter → hypertrophy of anal papilla, hyperplasia of internal hemorrhoids, constipation due to pain and fear of stool (increased impaction factor).

Factors such as internal sphincter spasm and anal stenosis are pathological changes in the process of anal fissure formation and development, not the cause of anal fissure. Clinical experiments confirmed that⁷: high tension of sphincter can induce anorectal skin ischemia, resulting in anal fissure formation; if the tension of sphincter is reduced and the blood supply of anal skin is restored, the anal fissure will be healed. The high tension of sphincter must be caused by the factor of impaction. Therefore, internal sphincter spasm is a pathological change in the development of anal fissure. There was a negative correlation between MARP and ADBF. In 1986, Gibbons and Read⁹ proposed that the spasm of internal sphincter, i.e. the increase of anal internal pressure, can lead to the ischemia of skin area of anal canal. Schouten¹⁰ simultaneously measured 178 patients with various anal diseases including anal fissure with Doppler laser skin blood flow meter and anorectal pressure meter. The results supported Gibbons' conclusion that the skin blood flow in the four quadrants of the front, back, left and right of the anal canal in healthy people were (1.5 ± 0.7) V, (0.7 ± 0.3) V, (1.7 ± 0.8) V, (1.6 ± 0.5) V, respectively. The blood perfusion pressure in the posterior anal commissure area was significantly lower than that in other areas of the anal canal. The MARP of chronic anal fissure patients was significantly higher than that of the control group and other anal diseases patients.

From the above analysis, we can see that each theory is relatively limited and cannot comprehensively summarize the pathogenesis and development factors of anal fissure. Therefore, we put forward a new theory of anal fissure-impaction theory.

New concept of anal fissure etiology-impaction theory

Impaction theory

In view of the shortcomings of the traditional theory of anal fissure etiology, the author repeatedly studies and breaks the traditional concepts and ideas in clinical work, puts forward a new concept of anal fissure etiology-impaction theory, the birth of the new theory, fills the defects of the traditional theory, can comprehensively summarize the causes and pathological changes of anal fissure, easy to understand and guide clinical treatment.

The so-called impaction theory refers to the impaction factors (various primary lesions) in anorectum that hinder defecation, cause excessive anal dilatation when defecating, exceed the anal dilatation limit, and open the whole layer of anal skin. The typical symptoms are periodic pain, repeated

anal dilatation or tear, and fusiform ulcer caused by wound infection, namely anal fissure.

Pathological evolution

Pathological evolution: due to the “impaction factor” hindering defecation, the anal canal caliber is enlarged beyond the limit. Due to the weakness of the anal canal, the blood perfusion pressure in the posterior anal junction area is significantly lower than that in other areas of the anal canal.⁹ So it was torn first. Anal fissure often occurs between the anal flap and the anal margin, the lowest superficial surface of the internal sphincter. At the initial stage, it was only the skin fissure of the anal canal, some of which reached the subcutaneous tissue or sphincter. If the anal canal is opened, it will be round or oval. The edge is neat, the bottom is shallow and elastic, and the longitudinal muscle separates the split bottom from the internal sphincter. If proper treatment is given, it can be cured. Because the internal sphincter is often spasmodic and contracted, the blood supply of the fissure is lack, and it is continuously stimulated by the “impaction factor” and secondary infection. The edge of the fissure is thickened, the surrounding is congested, and the bottom is hard. The annular fiber of the internal sphincter can be seen. There are abundant nerves in the fissure, which are sensitive to sensation. Slight stimulation can cause severe pain. The skin at the lower end of the fissure was inflamed, and the superficial veins and lymph circulation were blocked, causing edema and fibrosis, forming the connective tissue external hemorrhoids. The anal flap at the upper end of the fissure, edema and fibrosis of the anal papilla make the anal papilla further hyperplasia and hypertrophy (that is, the impaction factor is intensified), forming a vicious circle. The fibers of the lateral margin of the fissure became hard, and abscesses occurred in the surrounding tissues, which broke into the anal canal and formed fistulas. The internal sphincter of the fissure base was deformed obviously, in a spasm state, and the anal pressure increased. Therefore, there are 6 pathological changes such as fissure, external hemorrhoids of connective tissue, anal sinusitis, hypertrophic anal papilla, internal sphincter, and branching fibers of combined muscle, which are stimulated by inflammation for a long time. It can be seen that the theories of trauma, anatomical structure, infection and internal sphincter spasm are only the physiological and anatomical factors or pathological evolution of a certain link in the development of anal fissure, and the most fundamental pathological factor is the “impaction factor” in the primary anorectum.

Reasoning

Conditions: A block is embedded in the anorectum, which hinders defecation. If defecation is necessary, efforts must be made. The external force will make the anal caliber larger than the physiological limit. The skin of the anal canal will be torn and the anal fissure will be formed. If the blocking factor is not removed, the anal canal will be damaged repeatedly every time. The wound surface of the anal fissure will be repeatedly stimulated, or secondary infection will form a chronic ulcer. The anal fissure will change from the acute stage to the

chronic stage. Because the internal sphincter has the nature of nonrandom circular muscle, it is easy to spasm. The spasm is mostly at the outlet of anal canal. If the spasm continues, it can lead to permanent anal canal stenosis. It is a vicious cycle of pathology. The internal sphincter spasm and contraction form chronic anal fissure. The branching fibers of internal sphincter and combined muscle were stimulated by inflammation for a long time.

Hypothesis: The internal hemorrhoid, rectal tumor, hypertrophic anal papilla, and the fecal mass of the secret knot are regarded as the block of rectal impaction.

Conclusion: All of the above blocks hinder defecation, which will inevitably lead to excessive opening of anal caliber. Once they exceed the limit, the skin of anal canal will tear and form anal fissure.

Reasoning: In other words, why can't we regard hemorrhoids, rectal tumors, hypertrophic anal papillae, and fecal mass of secret knots as a kind of rectal impaction? This is the new concept of anal fissure etiology.

Clinical experience

In the long-term clinical practice, the author classifies a large number of cases of anal fissure no matter what kind, and takes the “impaction theory” as the guidance and “Tong as the use” as the treatment principle, thoroughly treats the root causes of internal hemorrhoids, hypertrophic anal papilla, rectal polyp, rectal prolapse, constipation, enteritis, diarrhea, etc. –eliminates the “impaction factor”. For those with chronic anal fissure with the formation of the pattern belt, the author appropriately uses the anal expansion therapy I. The second time laxation was performed, all of them received satisfactory effect, and no failure occurred.

Any anorectal specialist, in the clinical treatment of cases of internal hemorrhoids, rectal polyps, anal papillary fertilizer, often found these cases with anal fissure. Also, in the treatment of patients with anal fissure, there are often primary internal hemorrhoids, constipation, rectal tumor, rectal prolapse, that is, “impaction factor”. If the primary diseases of these cases are not eliminated, the simple treatment of anal fissure will not work, that is, temporary symptom relief, in a short period of time will still recur and the disease will worsen.

From 1975 to 1977, China made a general survey of industrial and mining, government agencies, schools, troops, urban residents in service industries, rural fishing grounds, etc. the total number of people examined was 76,692, including children, adults and the elderly. There are 57,292 cases of complete anorectal information, and 33,837 cases of anorectal disease, with a total incidence rate of 59%–10%. The incidence rate of male is 53.9%, and female incidence rate is 67%. The incidence rate of male and female is higher than that of men. The incidence rate of anal fissure is higher than that of male. The main reason is that women have fertility, and their activities after pregnancy are reduced, intestinal peristalsis weakened, and uterus is compressed to rectum. This shows that impaction is the root cause of anal fissure.

Clinical significance

The “impaction theory” is used to summarize the pathological factors of anal fissure and to explain the occurrence, development, and pathological changes of anal fissure.

The theory of anatomical factors of anal fissure can only explain the congenital conditions of anal fissure occurring in special parts of anus, but not the direct factors of anal fissure formation. That is, without “impaction factor”, there is no direct factor of anal fissure, and anal fissure will not occur.

According to the theory of trauma, impaction is the condition and source of trauma, while trauma is the result of impaction hindering defecation.

In the Institute of infection of anal fissure, the author believes that infection can be secondary to the formation of anal fissure, which is the condition for the anal fissure to become chronic and pathological, while before the anal fissure, it is the aggravation of hemorrhoids and its transformation into “impaction factor”.

Internal sphincter spasm theory, chronic inflammatory stimulation and anal stenosis are the pathological changes in the development of anal fissure, not the cause of anal fissure.

Using the theory of impaction to study the formation and treatment of anal fissure has high academic and clinical value.

Through clinical observation, we can turn it into a theory, and use the correct theory to guide the work. The general principle for the treatment of anal fissure is “to use the general principle”, to correctly judge the causes of anal fissure, to thoroughly treat the primary disease, and to remove the “impaction factor”, we can obtain good treatment effect. We can't cut the internal sphincter, cut the Chlamys band, pursue the operation too much and become a simple “surgeon”. In this respect, traditional Chinese medicine advocates treating diseases for the root, and it is worth learning from the whole concept. In the long-term clinical work, the treatment of chronic anal fissure under the guidance of the “impaction theory”, the treatment of primary diseases, the internal sphincter is not cut, the Chlamys band is not removed, through the long-term clinical observation, the patients are cured, the pain of surgery is reduced, the course of treatment is shortened, and the complications of surgery are avoided. Therefore, using the theory of impaction to study the formation of anal fissure and guide the treatment of anal fissure has high academic and clinical value.

In terms of internal administration of traditional Chinese medicine, xiaodaorunzao is the main drug. Prevention of this syndrome first, use Tongli medicine. In the treatment, the

theory of “general principle does not hurt”, “to pass for use” and “plug for pass” is followed. According to traditional Chinese medicine, the cause of this disease is large intestine dryness and heat, block of Qi and machine, crisscross Qi and blood, crisscross meridians and collaterals, and bleeding with doors.

Modern Chinese medicine develops the essence of traditional medicine, absorbs the advantages of world medicine and Western China, attaches importance to the organic integration of macroscopic and microscopic aspects, carries out research on regional anatomy, embryology, pathology, cytology, and neurology. Under the premise of traditional Chinese medicine, it integrates modern medical science and technology, and actively develops EPH minimally invasive surgery. Anal fissure recovered.

Conflict of interest

The authors declare no conflicts of interest.

REFERENCES

1. Chen Shaoming, et al. *Therapeutics of Modern Chinese Anorectal Diseases*, Published By People's Health Press, December 2019 1bALL C. *The Rectum, Its Diseases, And Developmental Defects*. London: Hodder and Stoughton; 1988.
2. Blaisdell PC. Pathogenesis of anal fissure and implications as to treatment. *Surg. Gynecol. Obstet.* 1937;65:672-7.
3. Hananel N. Re-examination of clinical manifest at ions and response to therapy of fissure-in-ano. *Dis. Colon. Rectum.* 1997;40:229.
4. Fw Rankin, Barga JA, Baie LA. *The Colon, Rectum, And Anus*. Philadelphina: WB Saunders; 1932. p. 584-93.
5. Shafik A. A new concept of the anatomy of anal sphincter mechanism and the physiology of defecation: chronic anal fissure: a new fherorv of pathogenesis. *Am. J. surg.* 1982;144:262.
6. Eisenhammer S. The evaluation of the internal anal sphincter otomy. Operation of the internal anal sphincter otomy operation with special reference to anal fissure. *Surg. Gyn. Obst.* 1959;109:583.
7. Schouten WR, Briel JW, Auwerda JJ, De Graaf EJ. Ischaemic nature of anal fissure. *Br. J. Surg.* 1996;83:63.
8. Northman BJ, Schuster MM. Internal anal sphincter derangement with anal fissure. *Gastroenterol.* 1974;67. Two hundred and sixteen.
9. Gibbons CP, Read NW. Anal hypertonia in fissures: cause or effect? *Br. J. Surg.* 1986;73:443.
10. Schouten WR, Briel JW, Auwerda JJ. Relationship. between anal pressure and anodermal blood flow. *Dis. Colon. Reetum.* 1994;7:664-9.